

China-VO 3.0 科学应用案例

时域天文数据中心

许允飞

国家天文科学数据中心

报告提纲

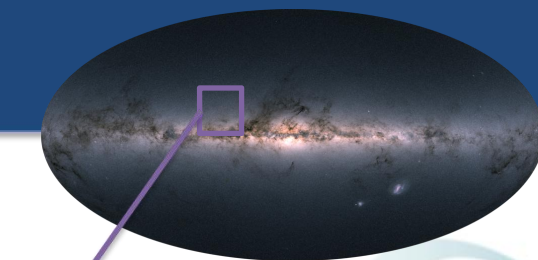
- 时域天文数据融合
- 时域天文数据中心核心需求
- 主要功能演示
- 数据接入和权限控制



时域天文数据融合

空间望远镜
EP、SVOM、HMXT、CSST

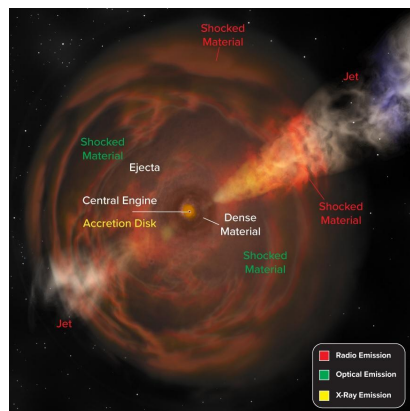
空间望远镜多
波段观测数据



光学/红外: LAMOST、CSST、SDSS、Gaia、.....



时域
天文
事件

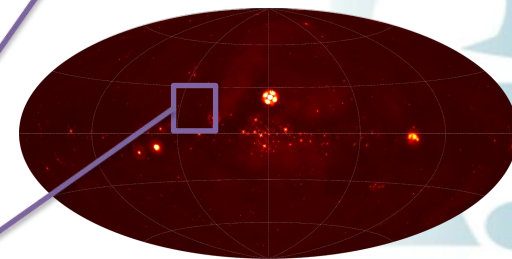


数据融合

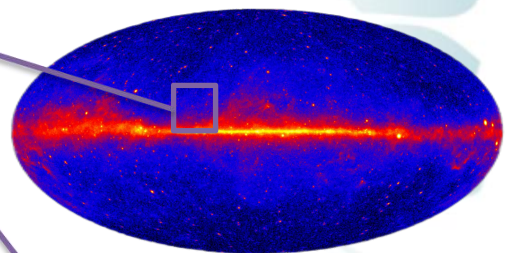
- 实现时域天文事件的快速多波段天体证认, 揭示其物理过程
- 不断产出高度精确的多波段融合图像和星表, 支持开展更广泛的天体物理学研究



同一目标天区
多波段历史存档
数据



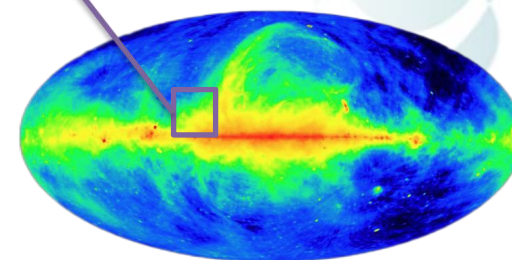
X射线: SVOM、EP、HXMT、.....



伽马射线: HXMT、Fermi、Swift、.....

地基望远镜
WFST、Mephisto、司天、2.16/2.4

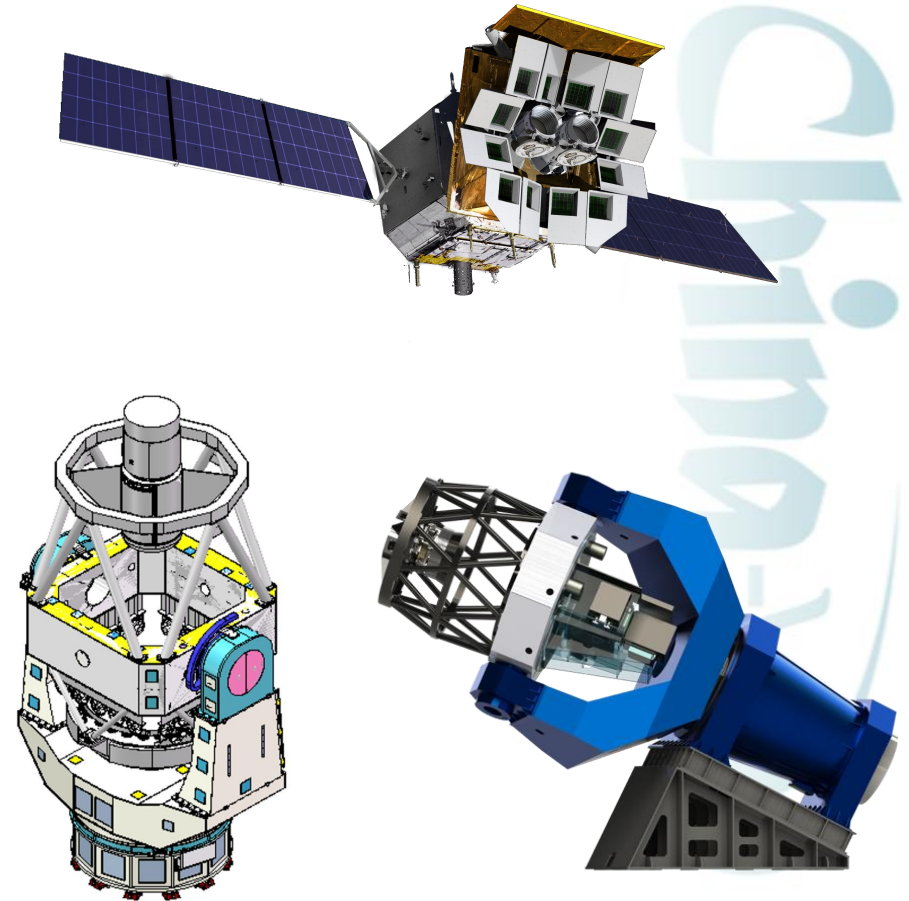
地基观测
光学/红外/射电
波段数据



时域天文数据中心

核心需求:

- 时域数据处理和展示
- 多望远镜数据的整合与实时更新
- 警报监听/发布与后随观测规划
- 用户在线合作研究和数据分析



时域天文数据中心

主要功能:

1. 时域警报管理
2. 观测规划
3. 观测计划查询
4. 暂现源查询
5. 数据获取
6. 暂现源证认
7. 在线数据分析

NADC National Astronomical Data Center Platform 3.0 Beta

Start Time: 2023/04/01
End Time: 2023/04/19 00:00
SUBMIT

Alert List
TeleScopes
Observation Plan
Data Access
Cross Matching
Light Curve Generation

GAL: 4.0524192 -2.6476122

OBSERVATION DATA X TRANSIENT CANDIDATES X

Name	obs_id	RA	Dec	Obs Start Time	Exposure Time	Estimated Flux	Net Counts	Bkg Counts	Net Ra
ep06800004039wxt13s1	06800004039	140.258	-55.283	2023-04-18T11:46:21Z	881	5.44e-11	23.969849	0.37688443	0.0272
ep06800004038wxt13s1	06800004038	140.311	-55.2915	2023-04-18T10:11:59Z	882	6.61e-11	29.15625	0.34375	0.0330
ep06800004029wxt15s4	06800004029	83.9334	-66.0707	2023-04-17T20:02:36Z	619	1.20e-10	37.243523	0.19689119	0.0601
ep06800004029wxt15s3	06800004029	81.3037	-69.6526	2023-04-17T20:02:36Z	619	1.61e-10	49.959183	0.46938777	0.0807
ep06800004029wxt15s2	06800004029	80.0516	-71.9891	2023-04-17T20:02:36Z	619	2.41e-10	74.69743	0.45641026	0.1206
ep06800004029wxt15s1	06800004029	84.9052	-69.7417	2023-04-17T20:02:36Z	619	2.74e-10	84.833336	0.38541666	0.1370
ep06800004028wxt15s4	06800004028	83.9335	-66.0697	2023-04-17T18:28:13Z	618	1.12e-10	34.632652	0.2244898	0.0560
ep06800004028wxt15s3	06800004028	81.2325	-69.6614	2023-04-17T18:28:13Z	618	1.46e-10	45.01015	0.4111675	0.0728
ep06800004028wxt15s2	06800004028	84.8708	-69.7496	2023-04-17T18:28:13Z	618	2.19e-10	67.63265	0.6479592	0.1094

Powered by China-VO

时域警报管理 (GCN-ATel-VoEvent)

The screenshot displays the National Astronomical Data Center Platform 3.0 Beta interface. The main window shows a star field with a grid overlay, likely representing a transient search area. The interface includes a sidebar with navigation options and a top toolbar with search and zoom controls.

Navigation Sidebar:

- Transient List
- Alert List
- TeleScopes
- Observation Plan
- Data Access
- Cross Matching
- Light Curve Generation

Top Bar: National Astronomical Data Center Platform 3.0 Beta

Search Bar: GAL 266.4049948 -28.9361739

Grid Coordinates: 20°-0'-0", 10°-0'-0", 0°-0'-0", -10°-0'-0", -20°-0'-0"

Bottom Right: ALADIN

Footer: Powered by China Vo

时域警报管理 (GCN-ATel-VoEvent)

NADC National Astronomical Data Center Platform 3.0 Beta

Transient List
Alert List
GW Event Select Al...
QUERY CURRENT CENTER POSITION
RA
Dec
Radius
Start Time 2023/04/15
End Time 2023/04/20 00:00
QUERY
Telescopes
Observation Plan
Data Access

GAL 29.3985340 -10.3892404 AIT

ALERT DETAILS X

Atel ID	Title	RA DEC	sources	Publish Date	Email	Tags	Atel Type	Auth
15993	Palomar Gattini-IR discovery ...	(287.5799583 ,10.539233)		2023-04-19T03:24:00	ykong@caltech.edu	Cataclysmic Variable, Nova, ...	discovery classification	M. K
15992	Spectroscopic confirmation ...	(189.1585 ,2.22422)		2023-04-17T22:26:00	ajct@iaa.es	Optical, Cataclysmic Variable...	classification	I. Pe
15991	Videorecording Baily beads o...			2023-04-17T16:29:00	None	Optical, Request for Observat...	observation	None
15990	Possible new nova or dwarf ...	(195.974666666667 ,-64.78614)		2023-04-15T10:59:00	p.groot@astro.ru.nl	Optical, Binary, Cataclysmic ...	discovery	Paul

Powered by China VO

时域警报管理 (引力波事件警报)

The screenshot displays the National Astronomical Data Center Platform 3.0 Beta interface. The main window shows a star field visualization with a grid overlay. The coordinates are GAL 266.4049948 -28.9361739. The interface includes a sidebar with navigation options: Transient List, Alert List, TeleScopes, Observation Plan, Data Access, Cross Matching, and Light Curve Generation. The Transient List section shows Start Time 2023/04/18 00:00 and End Time 2023/04/20 00:00, with a SUBMIT button. The star field visualization shows a dense field of stars, with a grid overlay indicating coordinates. The coordinates are GAL 266.4049948 -28.9361739. The interface is powered by China VDO and features the ALADIN logo in the bottom right corner.

NADC National Astronomical Data Center Platform 3.0 Beta

Transient List

Start Time 2023/04/18 00:00

End Time 2023/04/20 00:00

SUBMIT

Alert List

TeleScopes

Observation Plan

Data Access

Cross Matching

Light Curve Generation

GAL 266.4049948 -28.9361739

AIT

20°-0'-0"

10°-0'-0"

0°-0'-0"

-10°-0'-0"

-20°-0'-0"

20°-0'-0"

10°-0'-0"

0°-0'-0"

-10°-0'-0"

-20°-0'-0"

China VDO

ALADIN

观测规划 (引力波电磁对应体搜寻)

NADC National Astronomical Data Center Platform 3.0 Beta

GAL 165.9152234 -71.4737995 AIT

- Transient List
- Alert List
- GW Event: Select Alert GW190425
- QUERY CURRENT CENTER POSITION
- RA
- Dec
- Radius
- Start Time: 2023/04/18 00:00
- End Time: 2023/04/20 00:00
- QUERY
- TeleScopes
- Observation Plan
- Data Access

ALADIN

Powered by **China VBI**

观测规划 (引力波电磁对应体搜寻)

NDC National Astronomical Data Center Platform 3.0 Beta

164.6219082 +80.4398603

AIT

Transient List

Alert List

GW Event Select Alert GW190425

QUERY CURRENT CENTER POSITION

RA

Dec

Radius

Start Time 2023/04/18 00:00

End Time 2023/04/20 00:00

QUERY

Telescopes

Observation Plan

Data Access

90°0'0" 45°0'0" 0°0'0" -45°0'0" 90°0'0"

135°0'0" 90°0'0" 45°0'0" 315°0'0" 270°0'0" 225°0'0"

ALADIN

Powered by China VDO

观测规划 (依据视场的不同规划方式)

The screenshot displays the National Astronomical Data Center Platform 3.0 Beta interface. The main view is a star field with a grid of observation planning overlays. A prominent pinkish-purple band, likely representing a field of view or a specific observation path, is visible. The interface includes a sidebar with navigation options and a telescope property panel.

National Astronomical Data Center Platform 3.0 Beta

Transient List
Alert List
TeleScopes
Telescope: Select TeleS... A1T
Telescope Property
Telescope Name: A1T
Longitude: 88.726E
Latitude: 47.59N
Altitude: 1025m
Field: 1.96 deg*2
ADD TELESCOPE
Observation Plan
Data Access
Cross Matching
Light Curve Generation

GAL 317.9300566 -16.4827203
AIT

60°00"
40°00"
20°00"
0°00"
5°00"
0°00"

Powered by China VSO

观测规划 (依据视场的不同规划方式)

NADC Gravitational Wave Follow-up Observation Plan & Transient Identification Center

RIGHT LIST

Telescopes

Telescope: Select TeleS...
A1T

Telescope Property

Telescope Name: A1T
Longitude: 88.726E
Latitude: 47.59N
Altitude: 1025m
Field: 1.96 deg²

ADD TELESCOPE

Observation Plan
Transient List
Data Access
Cross Matching

FoV: 258.19°

ALADIN

Powered by **China**

观测计划查询

NADC National Astronomical Data Center Platform 3.0 Beta

GAL 4.5013080 +17.2384793 AIT

- Alert List
- Telescopes
- Observation Plan

RA

Dec

Radius

Start Time
2023/04/20

End Time
2023/04/21

QUERY TRACK

SEND TO OMM PROPOSAL

- Transient List
- Data Access
- Cross Matching

Powered by **China VO** ALADIN

暂现源查询

NADC National Astronomical Data Center Platform 3.0 Beta

352.7537661 +32.4039726

AIT

- Transient List
- Alert List
- GW Event: Select Alert GW190425
- QUERY CURRENT CENTER POSITION
- RA
- Dec
- Radius
- Start Time: 2023/04/18 00:00
- End Time: 2023/04/20 00:00
- QUERY
- Telescopes
- Observation Plan
- Data Access

20°0'0" 10°0'0" 0°0'0" -10°0'0" 20°0'0" 0°0'0"

ALADIN

Powered by **China**

观测数据查询

NADC National Astronomical Data Center Platform 3.0 Beta

GAL AIT

- Transient List
- Alert List
- TeleScopes
- Observation Plan
- Data Access

SEARCH CURRENT CENTER POSITION

Object Name

NAME RESOLVER

RA

Dec

Radius

Observation ID

Start Time

End Time

OBSERVATION PLAN X TRANSIENT CANDIDATES X

ID	Workplan ID	Obs ID	Obs Type	Obs ID	Source RA	Source Dec	Request Obs Duration	WXT CMOS	WXT CMOS X	WXT CMOS Y	Time Constraints	Obs Start Ti
171...	13	1996492...	GP-PPT	4060	225	30	30000	16	2048	2048	2022-10-01T08:00:00	2023-04-19T
171...	13	1996492...	GP-PPT	4059	225	30	30000	16	2048	2048	2022-10-01T08:00:00	2023-04-19T
171...	13	1996492...	GP-PPT	4058	225	30	30000	16	0	0	2022-10-01T08:00:00	2023-04-19T
171...	13	1996492...	GP-PPT	4057	213.75	19.471	30000	16	2048	2048	2022-10-01T08:00:00	2023-04-19T
171...	13	1996492...	GP-PPT	4056	146.25	-19.471	10000	16	0	0	2022-10-01T08:00:00	2023-04-19T
170...	13	1996492...	GP-PPT	4055	213.75	19.471	30000	16	0	0	2022-10-01T08:00:00	2023-04-19T
170...	13	1996492...	GP-PPT	4054	205.548	28.377	30000	16	2048	2048	2022-10-01T08:00:00	2023-04-19T
170...	13	1996492...	GP-PPT	4053	205.548	28.377	30000	16	2048	2048	2022-10-01T08:00:00	2023-04-19T
170...	13	1996492...	GP-PPT	4052	182.526	18.543	30000	16	2048	2048	2022-10-01T08:00:00	2023-04-19T

暂现源证认

NDC National Astronomical Data Center Platform 3.0 Beta

Start Time: 2023/04/18 00:00

End Time: 2023/04/20 00:00

SUBMIT

Alert List

TeleScopes

Observation Plan

Data Access

Cross Matching

Light Curve Generation

GAL 6.4837353 +5.8361290

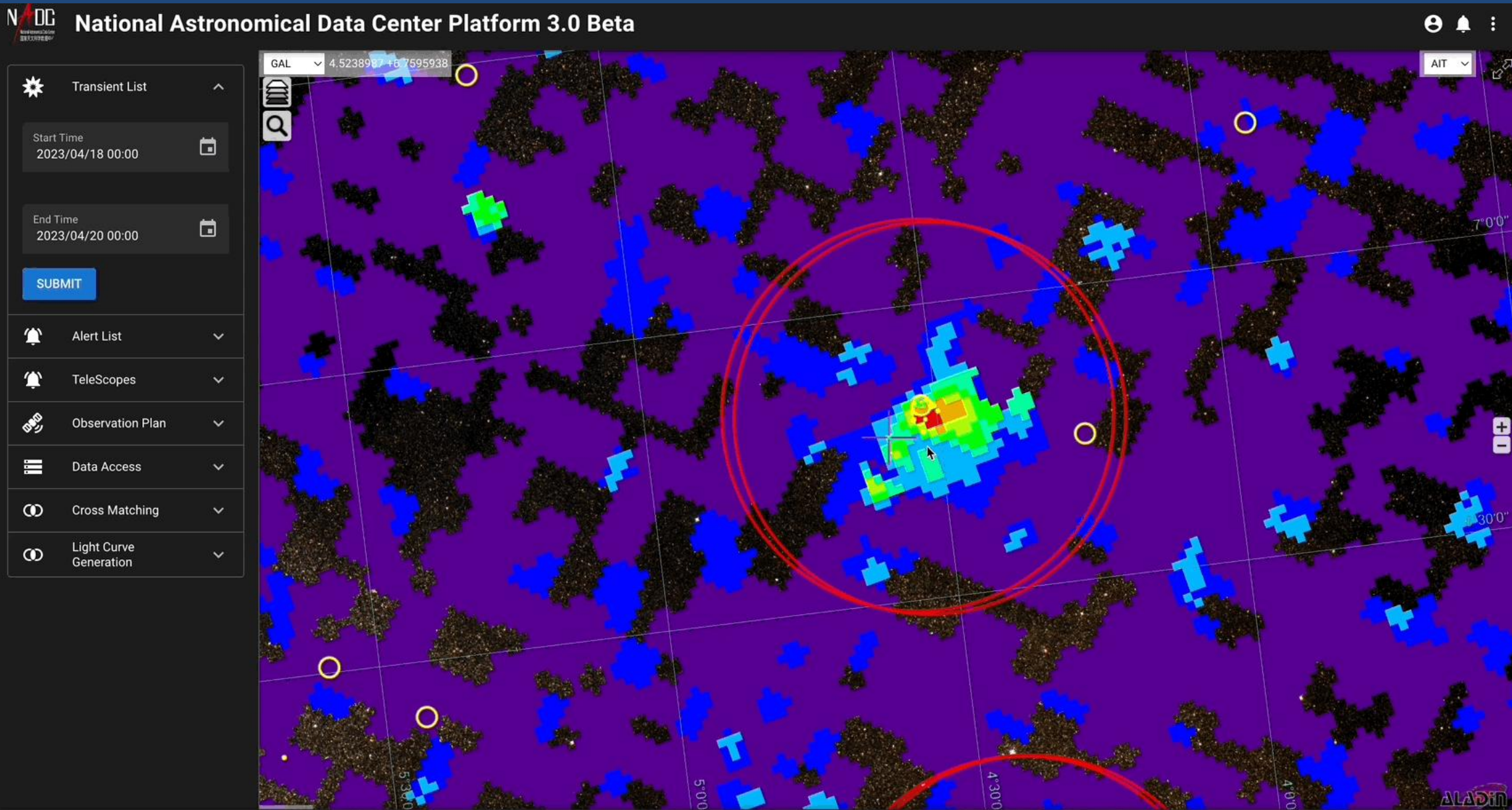
AIT

15°0'0" 10°0'0" 5°0'0" 0°0'0"

ALADIN

Powered by **China VSO**

暂现源证认



在线数据分析



- 基于容器及 Jupyter Lab实现
- 可以直接调用存储在云端的数据
- 需要针对具体的数据分析功能定制容器（如EP数据叠加分析、任意天区长期光变生成等）

The screenshot displays the JupyterLab environment. On the left, a file browser shows a directory named 'data' containing files like '1024px-Hubble_Inter...', 'bar.vl.json', 'Dockerfile', 'iris.csv', 'japan_meterological_a...', 'Museums_in_DC.geoj...', 'README.md', and 'zika_assembled_geno...'. The main area is a code editor titled 'Data.ipynb' with the following code:

```
Open a CSV file using Pandas
```

```
In [5]: 1 import pandas
        2 df = pandas.read_csv('../data/iris.csv')
        3 df.head(20)
```

The output shows a table of iris data:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	se
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa

Below the code editor, there is a large image of a galaxy and a bar chart titled 'bar.vl.json'. The bar chart shows a distribution of values, with a peak around 90. The x-axis is labeled '1024px-Hubble_Interacting_Galaxy_AM_0500-620_(2008-04-24).jpg'.

望远镜接入和数据权限

- 该系统可以针对具体望远镜独立部署
- 在流水线中增加节点，即可实现数据接入
- 各望远镜间数据完全独立且隔离，授权用户才能访问
- 可实现合作望远镜间的协作，联合观测和数据融合



请各位领导、专家指正！

